

- Thus, the electrolyte compositions of Kohjiya and Miura are **dry** and therefore, cannot be a gel.
2. The presently claimed electrolyte composition is a gel because the amount of the electrolyte solution is within the range of 100 to 10,000 parts by weight, based on 100 parts by weight of the polyether binary copolymer.
 3. The Takatera (US '638) electrolyte requires a weight ratio of the polymer blend of 30-100 parts by weight relative to 100 parts by weight of the nonaqueous solvent because Takatera discloses an inferior polymer, which exhibits deficiencies such as being difficult to shape, having insufficient mechanical strength, or having low ionic conductivity, as shown in column 6, lines 1-12 of Takatera.
 4. The compositions of Kohjiya and Miura do not exhibit the deficiencies of the Takatera polymer and therefore, a person having ordinary skill in the art would have had no motivation to combine the polymers of Kohjiya and Miura with the specific solvent to polymer ratio of Takatera.

Regarding items 1 and 2 above, the Examiner initially asserted that ionic bonds within the polymers of Kohjiya and Miura would not be present if they were completely dry and therefore, the compositions of Kohjiya and Miura must necessarily be in gel form. However, Applicants' representatives pointed out that the compositions of Kohjiya and Miura are "sufficiently dried" and that even if a small amount of solvent were left in the polymers of Kohjiya and Miura, the ratio of solution to polymer **would never be within the presently recited range requirement**, wherein the electrolyte composition is at least half electrolyte solution by weight.

The Examiner then suggested that Applicants amend the claims to include the specific range asserted during the interview. However, Applicants' representatives pointed out to the Examiner that claim 1 was amended to recite "wherein the amount of the electrolyte solution is within the range of 100-10,000 parts by weight, based on 100 parts by weight of the polyether binary copolymer" in the Amendment of June 28, 2010 and therefore, independent claim 1 does recite the asserted range. Thus, the Examiner agreed that the primary references standing alone, did not teach gels since the compositions are dried.

Regarding items 3 and 4, the Examiner asserted that the Kohjiya and Miura references fail to indicate that their electrolyte compositions do not exhibit the deficiencies outlined in Takatera. Accordingly, it was the Examiner's position that the compositions of Kohjiya and Miura may exhibit the deficiencies of Takatera.

In response, Applicants' representatives directed the Examiner to column 4, lines 37-40 of the Kohjiya reference, which explicitly states that "the polymer solid electrolyte of the present invention is superior in processing characteristics, molding characteristics, mechanical strength and flexibility, and the ionic conductivity is remarkably improved" and column 12, lines 35-39 of Miura, which explicitly states that "the solid polymer electrolyte shown in the present invention is superior in mechanical strength and flexibility, and a large area of thin-film shaped solid electrolyte can be easily obtained by utilizing the properties". Thus, the disclosures of Kohjiya and Miura clearly indicate that their respective polymers exhibit superior properties in molding, mechanical strength and ionic conductivity and therefore, do not exhibit the deficiencies outlined in Takatera. However, despite the express disclosures of Kohjiya and Miura, the Examiner maintained his position, arguing that that a person having ordinary skill in the art may be motivated to combine Kohjiya and Miura with the inferior Takatera polymer to attempt a more superior solid polymer electrolyte.

Thus, Applicants' representatives then asked the Examiner for suggestions for overcoming the outstanding rejections and the Examiner indicated that he would have to confer with his supervisor.

After speaking with his supervisor, the Examiner notified Applicants' representatives that his supervisor asserted that it is possible to overcome the outstanding rejections by providing experimental data showing that the presently claimed electrolyte composition exhibits superior and unexpected results over the prior art. Specifically, the supervisor indicated that it would be necessary to show unexpected results throughout the presently recited range in order to overcome the rejections, i.e., wherein the electrolyte solution is 100, 5,000, and 10,000 parts by weight, based on 100 parts by weight of the polyether binary copolymer.

Applicants thank the Examiner and his supervisor for their helpful suggestions.

Rejections Under 35 U.S.C. § 103(a)

The rejection of claims 1-8 under 35 U.S.C. 103(a) as being unpatentable over Kohjiya et al. (US 5,837,157), in view of Miura et al. (US 6,159,389), and further in view of Takatera et al. (US 6,159,638) and the rejection of claim 2 as being unpatentable over Kohjiya et al., in view of Miura et al., and further in view of Takatera et al., are respectfully traversed.

Initially, as acknowledged by the Examiner during the telephone interview of February 14, 2011, each of the **electrolyte compositions of Kohjiya and Miura is not a gel** because each of these respective compositions is “sufficiently dried”. See Example 1 of each of the Kohjiya and Miura references.

In contrast, the presently claimed electrolyte composition is a gel because the amount of the electrolyte solution in this composition is within the range of 100 to 10,000 parts by weight, based on 100 parts by weight of the polyether binary copolymer. Accordingly, since the Kohjiya and Miura references fail to teach polymer electrolyte compositions in gel form, the presently claimed polymer electrolyte composition, which contains a large amount of electrolyte solution, is clearly distinct from the teachings of Kohjiya and Miura.

To remedy the deficiencies of Kohjiya and Miura, the Examiner attempted to cite the Takatera reference, arguing that “it would have been obvious to one of ordinary skill in the art to incorporate the weight ratio of electrolyte solvent to polymer of Takatera et al.”, since the Takatera reference teaches a high solvent to polymer ratio.

However, as shown in the Rule 132 Declaration by Dr. Miura (hereinafter, “Declaration”) submitted herewith, when a large amount of electrolyte solution is combined with the dry, solid electrolyte compositions of Kohjiya, a **liquid** is obtained and a **gel cannot be achieved**.

Further, when a large amount of electrolyte solution is combined with the dry, solid electrolyte compositions of Miura, a **liquid** is obtained when the amount of electrolyte solution corresponds to the middle and upper ranges of the presently recited range and therefore, a **gel cannot be achieved**. Further, even though a gel was obtained when the Miura composition contained an amount of electrolyte solution within the lowest limit (100 parts by weight, based on 100 parts by weight of polymer) of claim 1, such composition was **considerably inferior** to the presently claimed polymer electrolyte composition.

Accordingly, based on the Declaration and comments of this response, the outstanding rejections have been overcome and should be withdrawn.

Discussion Regarding Declaration

In Experiment 1 of the Declaration, polymer electrolyte compositions of the present invention were prepared based on the examples of the present specification (polymer preparation based on Polymerization Example 1, crosslink test based on Example 1), wherein the polymer electrolyte compositions contained an amount of electrolyte solution of 100 parts by weight, 5,000 parts by weight, and 10,000 parts by weight, based on 100 parts by weight of the polyether binary copolymer. Thus, Dr. Miura prepared polymer electrolyte compositions corresponding to the lower, middle and upper ranges of present claim 1, as requested by the Examiner's supervisor.

In Experiment C1 of the Declaration, electrolyte compositions corresponding to Example 2 of Kohjiya et al. were prepared. Further, since the Examiner asserted that it would have been obvious to "adjust the electrolyte solution" in an electrolyte polymer based on the disclosure of Takatera et al., i.e., maintaining a high solvent to polymer weight ratio, to achieve the present invention, the C1 compositions (based on Kohjiya) were also subjected to the crosslink test (Example 1 of the present specification), wherein an amount of electrolyte solution corresponding to the lower, middle and upper ranges of present claim 1 was introduced to the C1 compositions.

In Experiment C2 of the Declaration, electrolyte compositions corresponding to Example 3 of Miura were prepared, and further subjected to the crosslink test.

Table 1

Electrolyte solution amount (parts by weight, based on 100 parts by weight of polymer)	100 pbw	5,000 pbw	10,000 pbw
Experiment 1 (Present invention)	Gelation	Gelation	Gelation
Experiment C1	Liquid (oily)	Liquid	Liquid
Experiment C2	Gelation	Liquid	Liquid

As shown in Table 1 of the Declaration (replicated above), the presently claimed polymer electrolyte composition is a **gel throughout the presently recited range** of claim 1.

In contrast, the compositions of Kohjiya (Experiment C1) failed to achieve a gel state when an electrolyte solution was present in the presently recited range and were thus **liquid**. Therefore, contrary to the Examiner's position, when a large amount of electrolyte solution is added to the composition of Kohjiya, i.e., combining the teachings of Takatera with Kohjiya, a **gel cannot be achieved**. Therefore, the presently claimed polymer electrolyte composition, which is a gel due to the presence of a large amount of electrolyte solution, **cannot be achieved** from a combination of Takatera and Kohjiya. Thus, the present invention, which is a gel, clearly cannot be predicted from the teachings of Kohjiya and Takatera.

Further, the compositions of Miura (Experiment C2) also failed to achieve a gel state, and were thus **liquid** when the electrolyte solution was within the middle and upper limits of the presently recited range of claim 1. As shown in Table 1, the composition of Miura was a gel only when the amount of the electrolyte solution was within the lowest limit (100 parts by weight, based on 100 parts by weight of polymer) recited in claim 1. However, as evidenced by the battery test and Table 2 of the Declaration (replicated below), this composition is significantly inferior to the presently claimed polymer electrolyte composition.

Table 2

Electrolyte Solution: 100 parts by weight

	Initial discharge capacity	Discharge capacity after 10 cycles
Experiment 1 (Present invention)	121 mAh/g	118 mAh/g
Experiment C2	103 mAh/g	65 mAh/g

Table 2 shows that the presently claimed polymer electrolyte composition exhibits a **significantly higher initial discharge capacity** (121mAh/g) when compared to the composition of Miura (103mAh/g). Further, after 10 cycles, the discharge capacity of the composition of Miura experienced a **significant decrease** from 103mAh/g to 65mAh/g (38 mAh/g decrease)

when compared to the polymer electrolyte composition of the present invention, which exhibited a mere 3mAh/g decrease in discharge capacity after 10 cycles. These superior results achieved by the presently claimed polymer electrolyte composition could not have been expected from the disclosure of Miura, which teaches a dried composition. Accordingly, a person having ordinary skill in the art would never have expected the superior results achieved by the presently claimed invention in light of the teachings of Miura in view of Takatera.

Thus, based on the above discussion and the attached Declaration, it is clear that the presently claimed polymer electrolyte composition exhibits superior and unexpected results over the prior art. Specifically, the composition of Kohjiya is a **liquid** when an amount of electrolyte solution is present in the range recited in claim 1 and **cannot achieve a gel**. In addition, although the composition of Miura can achieve a gel form when an electrolyte solution satisfying the lowest limit of the presently recited range is present, its initial discharge capacity is **significantly lower and further exhibits a significant decrease** after 10 cycles, when compared to the polymer electrolyte composition of the present invention, and is thus significantly inferior to the present invention.

Accordingly, since the Applicants have clearly shown that the present invention exhibits unexpected and superior results over the prior art throughout the presently recited range as requested by the Examiner's supervisor, these rejections have been overcome and should be withdrawn.

Conclusion

Therefore, in view of the remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

If, after reviewing this Response, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

Katsuhito MIURA et al.

/Chao Gao/

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Attachment: Declaration under 37 C.F.R. 1.132